A Social Systems Model of Nursing Home Use

By Rosalie S. Wolf

Causal modeling (path analysis) was applied to data from the 39 mental health catchment areas of Massachusetts to analyze the effects of sociocultural and health-resource variables on long-term-care utilization. The variables chosen explained 53 percent of the variance of long-term-care use by persons 60 and older: 41 percent was explained by the sociocultural variables and 12 percent by the health-resource variables. With data adjusted for age, the major determinant of long-term-care use was ethnicity: less long-term care was used in areas with more persons who were foreign-born or had a foreign-born parent. The effects of other health resources (supply of primary care physicians and use of mental and general (short-term) hospitals) were small and negative.

The long-term-care facility began as a home for the indigent aged; later it assumed medical functions for patients discharged from general hospitals, and, more recently, it has become the major referral facility for elderly former mental patients. Although the appropriateness of many admissions to long-term care has been challenged, nursing home utilization continues to rise. It has been asserted that one-quarter million to one-half million persons are admitted every year for other than medical reasons [1]. Even if optimal placement is achieved, however, a drop in nursing home use is not likely if current population trends and lifestyles continue [2,3]. Alternative care programs have been proposed, and a few are already in operation, but their effect, if any, on utilization patterns in long-term care is not yet clear. The factors affecting utilization of facilities and the relations among the factors need study to provide a rational basis for policy formulation, resource allocation, and planning. This article describes construction of a model of the determinants of long-term-care utilization and a test of the model using data from the Commonwealth of Massachusetts.

Previous Studies

A host of variables pertinent to long-term care (age, sex, marital status, living arrangements, degree of disability, psychological state, cultural factors, insurance coverage, income, medical practice, community resources, and organizational processes) have been identified

Address communications and requests for reprints to Rosalie S. Wolf, Director, Gerontology Planning Project, University of Massachusetts Medical Center, 55 Lake Avenue North, Worcester, MA 01605.

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in the literature, but there have been few efforts to incorporate these variables into multidimensional models. Andersen's behavioral model [4] includes the nursing home as a dependent variable, but published results based on his work have been limited to use of hospitals, physicians, and dentists [5]. Navarro, Parker, and White [6] formulated a stochastic and deterministic model of medical care that postulates a series of health service states, including nursing home care, through which a population moves from birth to death, but the complexity of the mathematical procedures required and lack of data have limited testing of this model. Feldstein and Kelman [7] specified a 47-equation econometric model of the entire health system, including nursing homes and home care in addition to short-term hospitals, physicians' office visits, and outpatient visits; the focus was primarily on economic factors. Dunlop [8], using a simplified framework, analyzed the determinants of utilization of several types of long-term-care facilities in the 48 contiguous states. Ruchlin and Levey [9] outlined a more elaborate demand taxonomy for long-term care consisting of four categories of variables: health-associated items such as morbidity patterns, life expectancy, and illness; physician-related factors, including prevailing medical practice, knowledge, and attending privilege arrangements; socioeconomic and demographic determinants; and economic predictors comprising family income, insurance, price of available substitutes, and supply. No empirical results have been reported.

Anderson, in a series of papers [10–14], described a model relating the social structure of the population to morbidity and utilization of health services. The health care system was seen as one way in which the population copes with the environment, a functional expression of the demographic, organizational, and technological characteristics of an area. Demographic factors affect the composition of the population as well as the distribution of health resources; these, in turn, are related to utilization rates. The departure point for Anderson's studies was the work of Parsons and Shils [15] (who sketched a general systems model bringing together the social, political, economic, and cultural elements of society) and of Gross [16] (who broadened the major concepts traditionally associated with national economic accounting into a set of social indicators for assessing the state of the nation). Whereas Gross's model was intended to include all economic subsystems and to be applied to the nation or to states, Anderson's was confined to health services and substate areas. Anderson's formulations oversimplify complex societal phenomena and emphasize social and cultural factors while neglecting organizational, behavioral, and economic issues; nevertheless his approach is well-suited to analyzing the problem addressed in the present study.

The Model

In contrast to Anderson's model, which analyzed a single service component, the framework developed here considers usage of long-term-care facilities in relation to other modes of care. The modes of

care chosen for the model were mental hospital care, care in general hospitals, and nursing home care. A network of causal paths was constructed connecting sociocultural variables to availability and utilization of these modes of care. Causality is defined according to Blalock [17]: "involving the notion of production"—i.e., cause produces effects; health services utilization is produced by sociocultural processes. The choice and causal ordering of the variables in the model were derived from microlevel investigations, although a few findings based on analyses of aggregate data are included in the results.

Data Sources

The units of analysis were the 39 mental health catchment areas of Massachusetts. These were chosen in place of health planning areas because at the time of the study more data were available for catchment areas. All variables were based on information for 351 cities and towns. Although the intention was to use only secondary sources, it was necessary to conduct a statewide survey for an assessment of community programs sponsored by the Massachusetts Department of Mental Health (DMH).

The source of data on utilization of nursing homes was a survey of all 901 facilities (serving 49,471 residents) conducted by the Massachusetts Department of Public Health (DPH) in the winter of 1973–74. Since patient-origin data were not included in this survey, the nursing homes were assumed to be local institutions, that is, serving only those persons living in the catchment area in which the facility was located. Patient-origin information for nursing home admissions had been collected the previous year by DPH from four of the six Massachusetts HSAs (excluding two in the Boston region); results indicated that approximately three-fourths of the persons admitted into nursing homes had lived in the homes' HSAs. These reports could not be used to adjust data from the 1973–74 DPH survey, because they were based on health planning rather than mental health catchment boundaries; however, they suggest likely limits on the extent of nonlocal nursing home placement that might bias the results. The 901 long-term-care facilities surveyed included 38 chronic disease and rehabilitation hospitals housing 5,803 patients; these hospitals offer services comparable to those of nursing homes. Patient origin data were available for this portion of the sample. Institutional census data were taken as equal to admissions for the year, since the mean length of stay was 349 days for all levels of nursing home care (from discharge data) and 395 days for the chronic disease hospitals.

Utilization and Resource Variables

Mental Hospital Utilization. Nursing homes have become the major referral facility for persons 65 years and older on discharge from mental hospitals. In 1969 40 percent of the elderly patients discharged from state mental institutions entered nursing homes [18]. Between 1956 and 1970 the percentage of aged patients in mental

hospitals decreased from 30 percent to 12 percent, while their percentage in nursing homes increased from 63 to 82 percent [19]. Interstate variations in these percentages have been attributed to variations in the degree to which nursing homes and mental hospitals substitute for one another [8].

The variable "mental hospital utilization" (*MHU*) was defined as the number of persons 65 and older per 100,000 area population who were admitted to DMH-operated inpatient facilities in the year ending June 30, 1974. Inpatient psychiatric services in Massachusetts in 1973 were provided by 10 state hospitals, four state mental health centers, three Veterans Administration installations, and 12 small private institutions. Admission data by patient origin and age were available for the state facilities but not for the private or federal ones; therefore the two latter types had to be excluded from the study even though they accounted for a sizable proportion of total discharges.

General Hospital Utilization. Fifty-four percent of nursing home residents are admitted from general (short-term) hospitals [20]. The percentage has increased sharply since the adoption of Medicare [21], which requires a minimum of three days of hospitalization before eligibility for extended coverage is granted. Patterns in the use of short-term and long-term facilities suggest some substitutability between them. The variable "general hospital utilization" (*GHU*) was defined as the number of persons 65 and older discharged from general hospitals per 1,000 area population during 1973; data were obtained from a 1971 Massachusetts Office of Comprehensive Health Planning (DPH) patient-origin study and from the annual hospital statistical reports of the Massachusetts Office of Health Planning and Statistics for 1973.

Community Care Resources. Many disabled elderly persons are cared for in their own homes by family members [22,23]. Twenty-six percent of those admitted to nursing homes come from their own residences [20]. There is some indication that millions of persons could postpone or avoid the use of nursing homes if other programs were available [24]; in Britain, many persons receive supportive home care although they would be considered institutional candidates in the United States [25]. Dunlop [8] found the number of home health agency admissions per 1,000 Medicare beneficiaries to be negatively related to use of nursing homes, especially personal care homes.

In the present model, community care resources were defined as any health or welfare services that help older people remain in the community. Information about availability or utilization of mental health care, primary care (as a surrogate measure for ambulatory care), home health care, housing, and supportive services was obtained in an effort to create a community resource profile for each catchment area. However, a factor analysis of data on the five types of resources did not yield the desired profile, but rather produced three components of which one, representing the housing and supportive services data, made no contribution to the multiple correlation coefficient in the model. This third component was therefore

dropped, and the other two components were used as separate variables.

The variable "community care resources" (*CCR*) was thus a composite measure based on the availability of community-based mental health programs and the utilization by those 65 and older of home health care programs in each catchment area. Home health care utilization was measured as the number of 1973 home health agency visits to persons 65 and older per 1,000 area population. The availability of community mental health services was measured on the basis of a questionnaire listing 24 such programs, which was sent to all DMH associate area directors. The directors were asked to indicate whether each program served exclusively or primarily persons 65 and older; "yes" responses in the 39 catchment areas ranged from zero to 24.

Primary Care Resources. Availability of primary care was measured by the number of general practitioners, family practitioners, and geriatricians per 100,000 area population, yielding the variable *PCR*. Internists were omitted because 42 percent of them were in the Boston area and many were not in primary care but in research and administration. Consequently the distribution of physicians in this study favors the rural areas and constitutes a bias in the analysis.

Long-term Care. Of the total 1972 discharges from skilled-nursing-care homes, 31 percent were because of death. The remainder were transferred to general hospitals, mental hospitals, other chronic care institutions, or their own homes [26]. However, the flow of elderly patients from nursing homes into general hospitals and mental hospitals represents only a small portion of admissions into these institutions, so the effect of long-term care on their use is not included in the model. Thus reciprocal causation is avoided in the model, at the price of neglecting a relatively small number of cases.

Further, although home care may replace general hospital care [25], general hospital care may substitute for mental hospitalization [27], and community care may substitute for institutional care [28], there is no evidence that these intersubstitutabilities are very applicable to the aged, unlike the substitutability between mental hospitals and nursing homes; also, there seems to be no usual sequence of transitions among them. Therefore no causal paths were postulated among them.

The variable "long-term-care utilization" (*LTU*) was defined as the number of persons 60 and older in area nursing homes per 1,000 population plus the number of persons 60 and older from each area in chronic disease and rehabilitation hospitals per 1,000 population.

Sociocultural Variables

Socioeconomic Status. The direction and strength of the association between socioeconomic status and the utilization of health services by the elderly vary by service. The poor aged are more likely to be in nursing homes [26] and mental hospitals [29], whereas the more affluent consume a larger quantity of general hospital and physician care [30]. An analysis of the 48 contiguous states at the

aggregate level [31] found the use of old-age institutions to be directly related to annual state mean per capita income and inversely correlated with the percent of elderly persons below the poverty threshold. A study of all U.S. counties [32] showed that both the physician-to-population ratio and the ability of hospitals to attract physicians were positively associated with the median family income of the county. Therefore the present model includes socioeconomic status as a direct determinant of the use of health resources, including long-term care. To the degree that the use of health resources in general influences the use of long-term care, socioeconomic status also has an indirect effect.

To quantify the socioeconomic status variable *SES*, a six-variable index was constructed from the 1970 census. These six variables were: median income of families and unrelated persons; percent of persons 65 and older with incomes below the poverty level; percent of employed males 16 and older who were operatives, service workers, and laborers, including farm laborers; percent of males 16 and older who were professionals, technical workers, and managers, excluding farm managers; percent of all families with incomes below the poverty level; and median school years completed by persons 25 and older.

A factor analysis of the six variables for the 39 areas produced two principal components, the first of which was strongly correlated with five of the six variables (excluding the percent of nonprofessional males 16 and older) and accounted for 58 percent of the variance. This component was taken as the *SES* variable for the study; positive scores represented areas with lower socioeconomic rankings.

Marital Status/Living Arrangement. Married persons comprise only 11 percent of the population in long-term-care facilities [33]; 42 percent of those admitted to long-term care from their own homes (prior to Medicare) had been living alone or with nonrelatives [21]. Caplow et al. [31] reported a strong positive relationship between the proportion of the elderly living alone in each state and the proportion of the elderly who were in the state's old-age institutions; they found a negative relationship between the proportion of the elderly living dependently with their children and the proportion of the elderly in institutions. Dunlop's multivariate analysis of long-term-care utilization [8] revealed the percentage of single, separated, and divorced elderly persons to be positively related to use of nursing and personal-care homes but negatively associated with use of intermediate-care facilities.

Marital status and living arrangement are also predictors of utilization of other health resources. Elderly persons living alone have the lowest discharge rate from general hospitals, indicative of their more favorable health status, whereas those living with nonrelatives have the highest discharge rate [30]. Physician visits for old people also vary by marital status: more per year for the elderly who are widowed, divorced, or separated than for those who are still married or who have never been married [30]. Living arrangement is

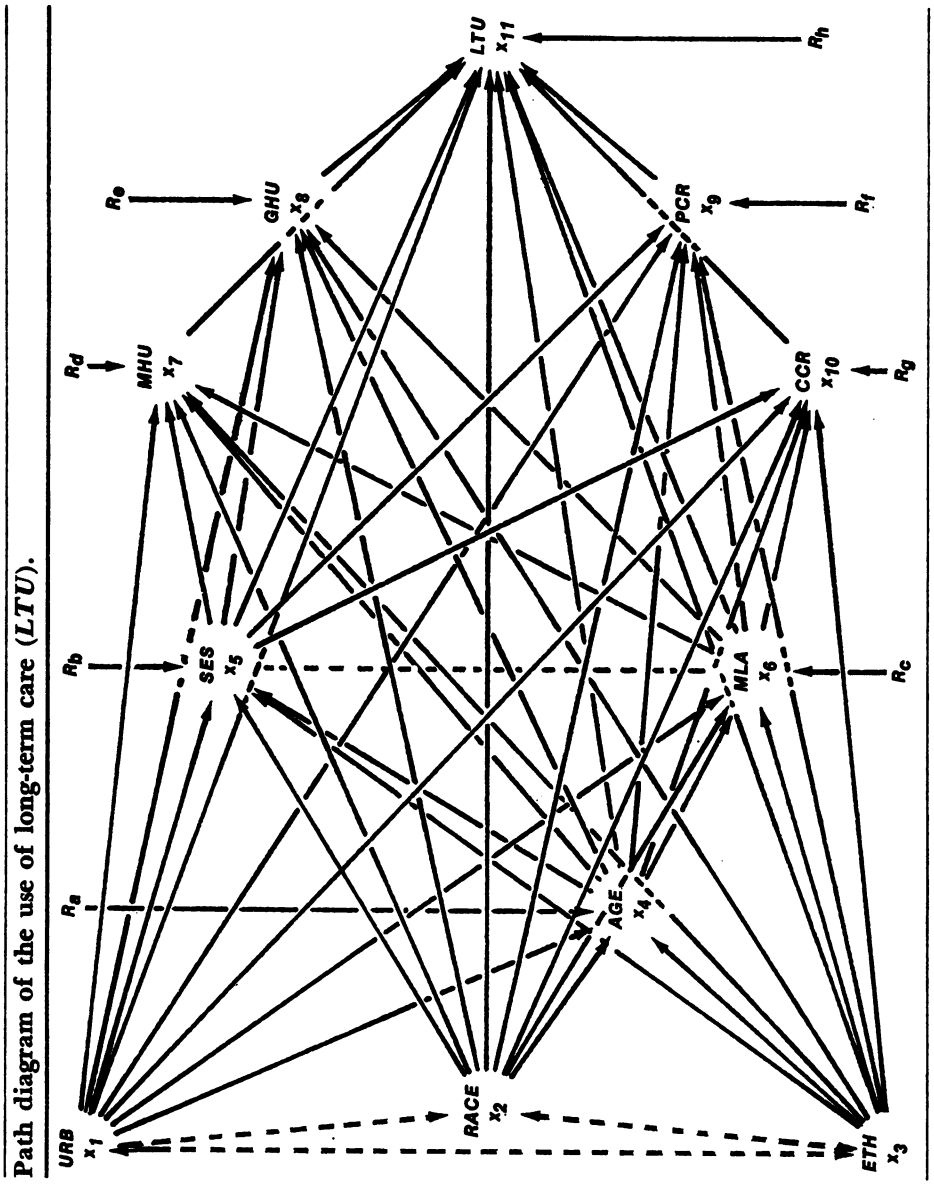
a critical factor in the use of home health care also: one 10-year study reported that two-thirds of the recipients lived alone [25].

Since both socioeconomic standing and marital status/living arrangement are postulated to have direct effects on use of health services, their interrelationship must be considered. The economic status of the elderly plays an important role in determining their living arrangements, and marital status affects their economic situations. (Those living alone or with nonrelatives have a median income appreciably lower than that for married couples.) Because marital status and living arrangement are here represented by a single variable, the relationship to socioeconomic standing is ambiguous; to designate a complete causal system, the covariation with *SES* is assumed to be noncausal.

The two factors, marital status and living arrangement, are highly interrelated: the correlation coefficient for percent of the population widowed and the percent living alone is 0.82. In this study, a single variable was constructed to represent both marital status and living arrangement. Four variables were chosen from the 1970 census data to create a marital status/living arrangement index by factor analysis: percent of females 14 and older who were widows; percent of males and females 25 and older who had never been married; percent of households that were one-person households with heads 65 and older; and percent of those 65 and older living with nonrelatives. The factor analysis produced two principal components, the first of which tapped all items and explained 61 percent of the variance. The variable *MLA* was computed as each area's score on the first principal component; a positive score denoted an area with a higher number of widows, those never married, and old persons living alone or with nonrelatives.

Age. In contrast to the high consumption by the elderly of nursing home, mental institution, general hospital, physician, and home health care [33–35], other community-based programs are underutilized by old people [36,37]. Old age increases the likelihood of reduced income, widowhood, and living alone or with relatives. The effect of age on health service use is thus both direct and indirect. The variable *AGE* was measured by the percentage of persons 65 and older living in each catchment area; data were taken from the 1970 census.

Ethnicity. Although ethnicity (used here to refer to group identification by country of birth or parent's country of birth) has become a standard measure of social differentiation and stratification, along with age, race, and urbanization, it is not often included in descriptive studies of health services. Ethnicity was here assumed to be characterized by traditional values associated with Old World peasant society, extended family patterns, and skepticism of scientific medical care; its *direct* influence on utilization of long-term care was postulated to be negative. An indirect influence, in addition, was anticipated because the foreign-born elderly are more numerous in urban settings and tend to have less occupational status and education. The



Path diagram of the use of long-term care (*LTU*).

measure for the variable *ETH* was taken from the 1970 census: the percentage of area population who were foreign-born or who were natives but had at least one foreign-born parent.

Race. There are racial differences in the utilization of health services by old people for all levels of care. Representing 9 percent of the total aged population in 1970, elderly nonwhites constituted 4 percent of nursing home residents and 12 percent of state hospital patients [38]. Their rates of discharge from general hospitals have been reported to be lower than for whites, and their visits per year to physicians fewer [30]. Data for the variable *RACE*—percentage of nonwhite households in each area—were taken from the 1970 census.

Urbanization. Use by the urban elderly of institutional facilities of all types increased between 1960 and 1970 [38,39], but the urban elderly are still slightly underrepresented in state mental hospitals. Older persons living on farms in the late 1960s had a rate of discharge from general hospitals about 30 percent higher than that for the urban elderly and a slightly higher rate than that for nonfarm rural aged [30]. However, stays were longer for urban patients. Physicians are visited less frequently by elderly farm residents than by elderly town or city residents [30]. Community programs, including home health services, are generally limited in rural areas.

Urbanization, race, and ethnicity were postulated to be correlated but not causally related. The 1970 census was the data source for the variable *URB*: the percentage of each catchment area's population who lived in rural portions of extended cities or in locations with 2,500 or fewer inhabitants.

Variable Transformations

By means of path analysis [14,40,41], the causal model was expressed algebraically and the parameters were estimated. This statistical procedure assumes that the relationships in the model are linear, additive, and asymmetric and that the variables are measurable on an interval scale. Wherever possible, steps were taken to meet these restrictions.

All variable distributions were tested for normality; only *RACE* was outside the acceptable range. A transformed race variable, calculated as $(RACE)^{1/4} + (RACE + 1)^{1/4}$ [42], was used in subsequent computations. To reduce redundancy, each variable was regressed on *AGE*; for those with significant ($p < 0.05$) covariance, the residual variable was used instead of the original form: this was the case for *LTU, SES, MLA,* and *GHU*. The variation among the areas in ethnicity predicted by urbanization and race was removed, and the residual variable was used for *ETH*. The initial notation was retained for these transformed variables.

Path Analysis

Because dependent variables are regarded as completely determined by some combination of other variables in the model, unmeasured residual variables ($R_a, \ldots, R_k$), uncorrelated with any other, were introduced. The figure on page 118 displays the path diagram

constructed from the postulated relationships discussed previously: arrows lead from each independent variable to a dependent one and from each residual variable to its counterpart. Unanalyzed correlations are indicated by double-headed dashed arrows, and noncausal covariation is represented by a dashed line. It is assumed that part of the covariation is due to the common dependence of the two variables on those that precede it in the model and part is due to uncorrelated variables outside the model.

Path analysis specifies the set of simultaneous equations that defines the diagram. For instance, the first equation for the model expresses *AGE* as a linear function of *URB, RACE,* and *ETH*

$$AGE = p_{43}ETH + p_{42}RACE + p_{41}URB + p_{4a}R_a$$

where p_{ij} are the path coefficients, or standardized partial regression coefficients, between variables i and j. These coefficients measure the direct effect of one variable on another—the fraction of the standard deviation of the dependent variable for which the independent variable is responsible if all others in the system are held constant.

The total effect of one variable on another is the zero-order correlation, r. It is the sum of the direct effect, all indirect effects through intervening variables in the causal chain, and joint and/or spurious effects due to mutual correlation. The indirect effect of one variable on another is calculated by multiplying the path coefficients along each indirect path (i.e., through another variable) that links the two and then summing the products for all such paths.

Results

The zero-order correlations among all variables in the model are shown in Table 1. Table 2 shows the standardized partial coefficients —the path coefficients—for each of the multiple-regression equations that form the path model. Table 3 displays the total, direct, indirect causal, and spurious/joint effects on long-term-care use of each variable in the model.

Table 1. Zero-order Correlation Matrix: Total Effects Among Variables

	URB	*RACE*	*ETH*	*AGE*	*SES*	*MLA*	*MHU*	*GHU*	*PCR*	*CCR*	*LTU*
URB	1.000	−0.290	0	−0.189	0.064	−0.486	−0.209	0.264	0.087	−0.494	−0.126
RACE		1.000	0	0.257	0.355	0.677	0.227	0.019	0.095	0.167	0.503
ETH			1.000	0.553	0.170	−0.140	0.033	−0.222	0.224	0.199	−0.331
AGE				1.000	0	0	0.142	0	0.384	0.309	0
SES					1.000	0.401	0.061	0.262	−0.069	0.077	0.199
MLA						1.000	0.243	0.021	−0.047	0.172	0.494
MHU							1.000	0.012	−0.011	0.136	−0.071
GHU								1.000	0.121	−0.350	−0.074
PCR									1.000	0.133	−0.162
CCR										1.000	0.051
LTU											1.000

Table 2. Path Coefficients: Standardized Partial Coefficients* of Multiple Regression Equations

Dependent variable	Independent variable										
	URB	*RACE*	*ETH*	*AGE*	*SES*	*MLA*	*MHU*	*GHU*	*PCR*	*CCR*	R^2
AGE	−0.125	0.221	0.553	...	...	...	...	...	...	...	0.386†
SES	0.148	0.467	0.319	−0.268	...	...	...	...	...	...	0.230
MLA	−0.343	0.633	−0.021	−0.216	...	...	...	...	...	...	0.598
MHU	−0.089	0.074	0.001	0.105	−0.204	0.160	...	...	...	...	0.088
GHU	0.293	−0.153	−0.470	0.355	0.353	0.060	...	...	...	...	0.273
PCR	0.233	0.046	0.047	0.390	−0.149	0.101	...	...	...	...	0.191
CCR	−0.545	0.017	0.053	0.173	0.161	−0.161	...	...	...	...	0.320†
LTU	0.228	0.270	−0.501	0.348	0.097	0.361	−0.211	−0.259	−0.176	0.002	0.533†

* See Table 1 for total (zero-order) correlations.
† Significant: $p < 0.05$.

Virtually no direct effect on the numbers of elderly patients in long-term-care facilities in an area can be attributed to the community care variable *CCR*. The path coefficient of 0.002 in Table 2 is far weaker than the total correlation of 0.051 in Table 1. Since no indirect paths were postulated, the 0.049 difference between these two may be attributed to spurious/joint correlation, due possibly to covariation of *CCR* with the other health variables and to causal relationships common to *CCR* and *LTU*. The total correlation of primary care resources (*PCR*) with *LTU* (−0.162) and the direct effect (−0.176) are almost equivalent. Again, no indirect causal paths were hypothesized in the model, so the difference (0.014) was assigned to spurious/joint influences. General hospital utilization (*GHU*) has a very weak zero-order correlation (−0.074) but a larger, negative direct effect (−0.259); the spurious/joint correlation in Table 3 is fairly substantial (0.185), indicating unmeasured relationships with the de-

Table 3. Components of Total Correlations of Each Variable with *LTU*

Independent variable	Total effect (r)	Direct effect (p)	Indirect causal effect	Spurious/ joint effect
URB	−0.126	0.228	−0.206	−0.148
RACE	0.503	0.270	0.243	−0.010
ETH	−0.331	−0.501	0.170	0
AGE	0	0.348	−0.256	−0.092
SES	0.199	0.097	−0.060	0.162
MLA	0.494	0.361	−0.067	0.200
MHU	−0.071	−0.211	...	0.140
GHU	−0.074	−0.259	...	0.185
PCR	−0.162	−0.176	...	0.014
CCR	0.051	0.002	...	0.049
R^2	0.533	...	...	...

pendent variable. The pattern of coefficients for mental hospital admissions (*MHU*) closely resembles that for general hospitals: total effect –0.071, direct effect –0.211, and a spurious/joint effect of 0.140. Although the effects on *LTU* of *MHU*, *PCR*, and *GHU* are weak, the fact that they are all negative suggests that these services tend to substitute for long-term care rather than generating demand for it.

The path coefficient between *LTU* and *MLA*, 0.361, is the second strongest found—not surprising, since the DPH study [43] of the long-term-care population reported that 91 percent were unmarried. The indirect effects are due to a weak relationship (–0.067) with the health resource variables and a rather substantial spurious/joint association of 0.200.

The total effect of socioeconomic status (*SES*) on *LTU* (0.199) partitioned into a weak direct effect (0.097) and a weak indirect effect (–0.060), with a somewhat larger spurious/joint effect (0.162). Most of the indirect causal influence comes from the relationship of *SES* and *GHU*. An area with a lower socioeconomic average will tend to have more persons 65 and older using general hospitals and fewer in long-term care. Apparently the socioeconomic status of an area does not strongly affect the number of elderly patients in long-term care, even though three-fourths of such patients are paid for by Medicaid and welfare [43]. A portion of the spurious relationship of both *MLA* and *SES* to *LTU* is due to their unanalyzed covariation.

Notwithstanding the fact that some of the variance in *LTU* that was explained by *AGE* was removed, the direct effect of *AGE*, 0.348, is still moderately strong and positive. According to the DPH survey [43] of patients in the long-term-care facilities studied, 83 percent were 65 and older. The direct effects of the age composition of an area on the *SES* and *MLA* scores can be seen (Table 2) to be negative; and they are surprisingly strong, considering that the zero-order correlations of *AGE* with *SES* and *MLA* are zero.

The strongest determinant of *LTU* in the model is the ethnicity variable, with a direct effect of –0.501. The zero-order correlation between *ETH* and *LTU* before the variables were transformed as described earlier was quite low: 0.047. When the variance due to *AGE* was removed from *LTU*, however, the zero-order correlation between the transformed variables increased to –0.331. The indirect effects of *ETH*, 0.170, are attributable to the fact that populations with larger numbers of persons of foreign stock tend to be older, have lower socioeconomic status, and have fewer general-hospital discharges, all of which affect use of long-term care positively. When these indirect relationships are controlled the true effect is revealed.

Areas with larger nonwhite populations tend to have more persons unmarried and living alone, and they contain more elderly persons; in turn, both *MLA* and *AGE* increase use of long-term care. Consequently a large portion (0.243) of the 0.503 zero-order correlation of *RACE* with *LTU* is offset by these indirect effects, yielding a weak direct effect of 0.270 and a negative spurious/joint effect (–0.010). (This relation between *RACE* and *LTU* is contrary to re-

ports of other research [8,31], perhaps because of the ecological grouping of the data. Nonwhites are underrepresented among nursing home residents in the state, but the analysis refers to characteristics of areas, not those of facilities.)

Urbanization also influences admissions of the elderly to long-term care, both directly and indirectly. Rural areas have proportionately more married couples and more persons living in families, more old people using general hospitals, and more primary-care physicians than urban areas, all of which decrease admissions to long-term care. These indirect causal effects account for –0.206 of the –0.126 zero-order correlation between *URB* and *LTU*. Subtracting the indirect effect and the spurious/joint effect of –0.148 from the zero-order correlation makes the direct effect of *URB* on *LTU* 0.228.

The order of importance of the variables determining long-term-care use, ranked by direct effect, differs considerably from their ranking by zero-order correlation: according to the path coefficients, the major contributors to long-term-care use in an area are smaller numbers of persons of foreign stock, more elderly persons unmarried and living alone, and more elderly residents. Of less direct impact as predictors are the proportion of nonwhites and the use of general and mental hospitals. Still weaker direct effects on long-term-care use are due to percent rural, supply of physicians, and the socioeconomic status of the area. Almost no effect comes from the community resource variable *CCR*. Together, these factors explain 53 percent of the variation in long-term-care utilization after variance due to *AGE* is removed. In a regression of the sociocultural variables only on *LTU*, separate from the regressions defining the path model, the variables *URB*, *RACE*, *ETH*, *AGE*, *SES*, and *MLA* explained 41 percent of the variance in *LTU*.

Other Health Services

The regressions in Table 2 defining the path model include four additional health service variables: *MHU*, *GHU*, *PCR*, and *CCR*. These not only provide information concerning the indirect effect of the independent variables on *LTU*; they also express the relationship of the sociocultural variables to the use or availability of the four health resources.

Mental Hospitals. Areas from which more elderly patients are admitted to mental hospitals have a greater percentage of urban, nonwhite, and aged persons and more persons unmarried and living alone, which is consistent with the literature. The proportion of persons of foreign-born stock shows no relationship to *MHU*. Contrary to expectation, the sociocultural variables explain only 9 percent of the variance in *MHU*. Other factors (admission policies, for example) are apparently important in determining whether older persons are admitted to mental hospitals in an area.

General Hospitals. The sociocultural variables account for 27 percent of the variance in general-hospital discharges. Areas with more general hospitalization of the elderly tend to have proportion-

ately more rural and aged persons and fewer nonwhites and persons of foreign stock. This description corresponds to survey findings that report more general-hospital discharges for the aged and for rural residents [30]. Attitudes among ethnic groups about professional medical care may explain the lower utilization rates in Massachusetts areas with a higher proportion of foreign stock.

Community Care Resources. Sociocultural factors account for 32 percent of the variance in *CCR*, due primarily to a moderate to strong negative relationship with *URB*. The path coefficients are weak but reflect the tendency for those areas in Massachusetts with a greater urban population, more elderly residents, lower socioeconomic status, and more persons unmarried and living alone to have more community-based health services than the state average.

No consistent pattern appears in the effects of sociocultural variables on use of these additional health services; each service is affected uniquely by such variables. Although urbanization is a major predictor for *CCR*, it is weakly associated with the other health programs. The ethnicity variable shows a moderately strong negative effect on both *GHU* and *LTU*; age appears as a fairly important determinant for both *GHU* and *PCR*. Of special interest is the fact that long-term-care utilization has a greater sensitivity to sociocultural factors than the other health services. It may be that nursing homes in the state, because they are mostly proprietary, have been more responsive to demand than health resources under governmental or professional control.

Primary Care Resources. The six sociocultural variables explain 14 percent of the variation in the supply of physicians (*PCR*). There are more general practitioners per 1,000 population in areas with greater percentages of rural and elderly people, with a higher socioeconomic status, and with more unmarried persons living alone than in the state generally. These findings agree with those of other studies on the distribution of primary care physicians [44–46].

Discussion

With structural equations of the type developed here, utilization rates of long-term care can be estimated for a variety of situations. Insight into the interrelationships among the important factors can suggest new strategies for intervention.

An important finding for planning in Massachusetts is the large proportion (41 percent) of variation in the use of long-term care that was explained by demographic and socioeconomic variables. From Table 2, a 1-percent increase in the proportion of persons 65 and older in an area will produce an additional 36 persons 60 or older in long-term care per 1,000 area population. This knowledge makes it possible to translate population projections into estimates of utilization rates. The marital status and living arrangements of the elderly also have been identified in the model as a major determinant, along with age. Should there be modifications in the lifestyle of the elderly in coming decades, then changes in use rates can be anticipated.

Until recently Massachusetts used a statewide average of beds per 1,000 elderly population as one of the criteria for certification of need for new facilities. Evidence from this study of variation in substate areas led to a modification of the need formula that is based on living arrangements of the elderly and the age of the population in each area [47].

The importance of the ethnicity factor as a determinant of long-term-care utilization in Massachusetts was previously unrecognized. It seems likely that the negative relationship found between *ETH* and *LTU* in the areas also exists within facilities, because of the high proportion (26.2 percent) of persons of foreign stock in the state. Data on the ethnic backgrounds of the population in long-term-care facilities will be needed to test this hypothesis. Census data indicate that persons of Italian or Portuguese background constitute the largest ethnic communities in the parts of Massachusetts that contain the largest proportion of foreign stock. These groups have been characterized as having strong religious-cultural-family ties, which might discourage their placement of elderly relatives in nursing homes or long-term hospitals except under dire circumstances. This hypothesis also needs verification; if it is true, however, any decline in ethnic ties in subsequent generations of Massachusetts residents will result in greater demand for long-term care. Until recently, giving up subgroup beliefs and attitudes for values common to the dominant culture was accepted as part of the assimilation process. In a study of the transmission of cultural heritages, Greeley and McCready [48] found that some Old World traditions are ignored and rejected, others are reinforced and maintained with little conscious effort, and still others are vigorously and tenaciously reinforced. Is caring for an elderly parent within the family a tradition that is being rejected, or will it be sustained? If this is a trait worth preserving, what government policies can help to promote it? The present findings suggest, as have other researchers [49–51], the need to learn more about how the family and the social network affect health behavior and how they can contribute to health care.

The negative relationship between general hospital use and nursing home utilization suggests that efforts to reduce long-term-care use might be centered in the general hospital. Brody et al. [52] report that the opening, in a general hospital, of a special unit for those 55 and older with acute medical and surgical problems reduced nursing home placements. Reorganizing the treatment process in general hospitals to meet the needs of chronically ill patients may reduce inappropriate placements in long-term-care facilities and also provide training and encouragement for families who would like to keep their relatives at home.

The lack of more conclusive evidence from this study for the effect of community resources on the utilization of long-term care is disappointing. The community care resource and primary care variables *CCR* and *PCR* added only 2 percent to the explained variance, and the greater part of this amount is from the physician supply.

The DMH-operated programs for the elderly are primarily intended for former mental hospital patients, who comprise only a small portion of old people estimated to suffer from moderate to severe mental impairment [53]. Only home health care programs have among their stated goals the prevention or deferment of institutionalization, and they may simply have been too few to make a difference.

The procedures described in this study are replete with assumptions about distributions, reliability of measurements, and the directions of associations. There are errors stemming from the use of nonrandomly aggregated data, insufficient number of units, and collinear variables. Removing the variance due to age from the other variables reduced the large spurious coefficients that appeared in the trial runs, but further effort in this direction should have been pursued in connection with the marital status/living arrangements factor. Also, a sizable proportion of the variance in long-term-care use is not explained by the variables included in the model. Some factors with obvious relevance were omitted because of the theoretical orientation of the study or because of difficulty in finding valid measures. The analysis of aggregate data is more appropriate for uncovering sociological patterns of intercorrelations than for dealing with psychological factors that affect health behavior. Organizational factors, such as admission policies, manpower, types of ownerships, and reimbursement schedules probably account for some of the variance.

At best, a social systems model can be only a poor representation of reality. In spite of the limitations, the present model offers a new perspective on long-term-care utilization in Massachusetts. It can provide the planner with information on which to make more rational decisions concerning future needs for long-term-care beds. It suggests two areas of investigation that may have potential for reducing long-term-care facility utilization: the family and the general hospital.

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